

Radiation Processing of Polycyclic Aromatic Hydrocarbons (PAHs) in Space: ICEE PoC

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Abstract

Small Polycyclic Aromatic Hydrocarbon molecules or PAHs (<30 carbon atoms) have been identified in comets, meteorites, asteroids, and interplanetary dust particles in our Solar System, while PAHs in the Interstellar Medium (ISM) tend to be much larger, usually between 50 to 100 carbon atoms in size. ***The cause of the size disparity between PAHs found in the ISM and Solar System as well as their influence on Solar System organics is not yet understood.***

Two chemical evolutionary paths have been proposed to explain the inventory of solar system organics. In one the prebiotic material was formed from the radiation induced modification of large pre-solar carbon-bearing species (e.g. ISM PAHs). The second path suggests that Solar System prebiotic matter is the result of bottom-up synthesis from small reactive molecules after the Solar System was formed. In this second scenario very few ISM PAHs survived the harsh pre-solar radiation as aromatic structures.

ICEE PoC (ICEE Proof of Concept) investigated factors impacting the chemical evolution of large PAHs irradiated under conditions similar to the proto-solar nebula. Likewise ICEE PoC will refine the technical parameters of the proposed ICEE (Institute for Carbon Evolution Experiment) laboratory.